

**THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Appellant(s): Senoo et al.
Appl. No.: 09/162,992
Conf. No.: 9466
Filed: September 30, 1998
Title: GEL ELECTRODE SECONDARY CELL
Art Unit: 1726
Examiner: Tracy M. Dove
Docket No.: 3712174-00037

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANTS' APPEAL BRIEF

Sir:

Appellants submit this Appeal Brief in support of the Notice of Appeal filed on June 13, 2012. This Appeal is taken from the Advisory Action dated May 10, 2012 and the Final Rejection dated February 13, 2012.

I. REAL PARTY IN INTEREST

The real party in interest for the above-identified patent application on Appeal is Sony Corporation by virtue of Assignments dated November 20, 1998, November 24, 1998, November 26, 1998 and November 30, 1998 and recorded at reel 009622, frames 0510-0513 in the United States Patent and Trademark Office.

II. SUMMARY OF CLAIMED SUBJECT MATTER

A summary of the invention by way of reference to the specification and/or figures for the independent claims is provided as follows:

Claim 26 is directed to a gel electrolyte secondary cell (Abstract, line 1; page 1, lines 5-6; page 7, lines 13-21; page 8, lines 1 and 9-18; page 11, lines 1-6; page 12, lines 18-19; page 13, lines 3-5, 10-13 and 18-21; page 14, lines 1-21; page 15, lines 1-16; page 16, lines 5-8; page 17, lines 9-18; page 22, lines 6-12; page 24, lines 9-15) comprising: a positive electrode (page 7, lines 16-18; page 8, lines 15-18; page 11, lines 1-5 and 13-21; page 12, lines 1-17; page 15, lines 10-11 and 19-21; page 16, lines 1-2; page 20, line 14; page 21, lines 1-5 and 19-22; page 22, lines 1-15); a negative electrode (page 1, lines 6-7; page 7, lines 16-18; page 8, lines 15-16; page 9, lines 12-16; page 11, lines 1-11 and 13-14; page 15, lines 10-11 and 19-21; page 16, lines 1 and 18-21; page 17, lines 1-6; page 20, lines 4-12 and 14; page 21, lines 1-5 and 9-18; page 22, lines 6-15) comprising a current collector (page 9, lines 15-16; page 10, lines 11-12 and 15-21; page 12, lines 14-17; page 17, lines 1-6; page 21, lines 14-18) and a powder mixture composed of a negative electrode active material having a mean particle size of 5 to 100 μm (page 9, lines 17-20; page 10, lines 13-14; page 11, lines 7-11; page 16, lines 12-15 and 20-21; page 18, lines 5-7; page 20, lines 4-9; page 21, lines 9-13; page 22, lines 17-19; page 23, lines 15-16; page 24, lines 1-15); and a gel electrolyte (page 1, lines 5-6; page 4, lines 1-4 and 10-21; page 5, lines 1-5 and 13-15; page 7, lines 16-21; page 8, lines 1 and 15-18; page 11, lines 1-6; page 12, lines 18-19; page 13, lines 10-13; page 14, lines 15-21; page 15, lines 1-9; page 17, lines 9-16) comprising an electrolyte salt (page 12, lines 18 and 20-21; page 13, lines 1-9; page 14, lines 15-17; page 17, lines 10-12), a non-aqueous solvent (page 12, lines 18-19; page 13, lines 10-17; page 14, lines 15-20; page 15, lines 6-9; page 17, lines 10-16) and a high-molecular weight material (page 12, lines 18-19; page 13, lines 18-21; page 14, lines 1-14 and 17-21; page 15, line 1; page 17, lines 12-16), wherein the non-aqueous solvent comprises propylene carbonate and ethylene carbonate, wherein a content of propylene carbonate ranges from 10 mol% to 75 mol% (page 7, lines 20-21; page 8, line 1; page 13, lines 14-17; page 15, lines 6-9; page 17, lines 10-12), and wherein the negative electrode active material comprises sintered meso-carbon micro-beads (page 7, lines 20-21; page 8, lines 6-11 and 17-21; page 9, lines 1-11; page 16, lines 12-15; page 20, lines 4-12; page 21, lines 9-13; page 23, lines 15-16; page 24, lines 1-15).

Although specification citations are given in accordance with 37 C.F.R. §1.192(c), these reference numerals and citations are merely examples of support in the specification for the terms used in this section of the Brief. There is no intention to suggest in any way that the terms of the claims are limited to the examples in the specification. As demonstrated by the reference numerals and citations, the claims are fully supported by the specification as required by law. However, it is improper under the law to read limitations from the specification into the claims. Pointing out specification support for the claim terminology in accordance with Rule 1.192(c) does not in any way limit the scope of the claims to those examples from which they find support. Nor does this exercise provide a mechanism for circumventing the law precluding reading limitations into the claims from the specification. In short, the reference numerals and specification citations are not to be construed as claim limitations or in any way used to limit the scope of the claims.

III. ARGUMENT

A. LEGAL STANDARD

Obviousness under 35 U.S.C. § 103

The Federal Circuit has held that the legal determination of an obviousness rejection under 35 U.S.C. § 103 is:

whether the claimed invention as a whole would have been obvious to a person of ordinary skill in the art at the time the invention was made...The foundational facts for the prima facie case of obviousness are: (1) the scope and content of the prior art; (2) the difference between the prior art and the claimed invention; and (3) the level of ordinary skill in the art...Moreover, objective indicia such as commercial success and long felt need are relevant to the determination of obviousness...Thus, each obviousness determination rests on its own facts.

In re Mayne, 41 U.S.P.Q. 2d 1451, 1453 (Fed. Cir. 1997).

In making this determination, the Examiner has the initial burden of proving a *prima facie* case of obviousness. *In re Rijckaert*, 28 U.S.P.Q. 2d 1555, 1556 (Fed. Cir. 1993). This burden may only be overcome "by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings." *In re Fine*, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). "If the examination at the initial stage does not produce a prima facie case of unpatentability, then without more the applicant is entitled to grant of the patent." *In re Oetiker*, 24 U.S.P.Q. 2d 1443, 1444 (Fed. Cir. 1992).

Moreover, the Examiner must provide explicit reasons why the claimed invention is obvious in view of the prior art. The Supreme Court has emphasized that when formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed. *KSR v. Teleflex*, 127 S. Ct. 1727 (2007).

Of course, references must be considered as a whole and those portions teaching against or away from the claimed invention must be considered. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve Inc.*, 796 F.2d 443 (Fed. Cir. 1986). "A prior art reference may be considered

to teach away when a person of ordinary skill, upon reading the reference would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the Applicant.” *Monarch Knitting Machinery Corp. v. Fukuhara Industrial Trading Co., Ltd.*, 139 F.3d 1009 (Fed. Cir. 1998) (quotation omitted).

B. THE CLAIMED INVENTION

Independent Claim 26 is directed to a gel electrolyte secondary cell comprising a positive electrode, a negative electrode, and a gel electrolyte. The negative electrode comprises a current collector and a powder mixture composed of a negative electrode active material having a mean particle size of 5 to 100 μm . The gel electrolyte comprises an electrolyte salt, a non-aqueous solvent and a high-molecular weight material. The non-aqueous solvent comprises propylene carbonate and ethylene carbonate, and a content of propylene carbonate ranges from 10 mol% to 75 mol%. The negative electrode active material comprises sintered meso-carbon micro-beads.

If a graphite material is used as a negative electrode in a non-aqueous electrolyte cell, propylene is decomposed due to the instability of propylene carbonate against a graphite material, thereby lowering the charging/discharging efficiency. See, Specification, page 5, lines 6-11. As set forth in Appellants' Affidavit submitted on August 9, 2011 (“*Affidavit*”), it is well known that the degree of decomposition of propylene carbonate in a graphite cell varies depending on the physical properties of the graphite material. See, *Affidavit*, ¶ 5. For example, the conventional understanding at the time of the invention was that a graphite material having a larger particle size has a smaller surface area and thus is less susceptible to decomposition of propylene carbonate. See, *Affidavit*, ¶ 5.

If, however, the graphite material has a small particle size, the conventional understanding was that decomposition of propylene carbonate is significant, resulting in a discharge capacity loss that lowers the charging/discharging efficiency of the battery. See, *Affidavit*, ¶ 5. Therefore, the conventional understanding was that it was desirable to use graphite having a larger particle size in a battery containing a propylene-carbonate based electrolytic solution. See, *Affidavit*, ¶ 5. However, in a non-aqueous gel electrolyte cell, a graphite material having a smaller particle size is desirable in order to maintain the electron and ion conductivities between the particles of the graphite material in the anode. See, Specification, page 6, lines 6-18. Therefore, at the time of the invention, it was difficult to obtain a gel

electrolyte secondary cell simultaneously having a large discharge capacity and a high charging/discharging efficiency. See, Specification, page 6, lines 19-21; page 7, lines 1-15.

Appellants surprisingly discovered that when the graphite negative electrode material comprises sintered meso-carbon micro-beads, a high charging/discharging efficiency can be obtained in a gel electrolyte containing propylene carbonate even when the graphite material has a small particle size and, thus, a high discharge capacity. See, Specification, page 7, lines 13-21; page 8, lines 1-4. In contrast, when the negative electrode material comprises fired petroleum coke having a small particle size, the charging/discharging efficiency is significantly lower when the gel electrolyte includes propylene carbonate. See, Specification, Tables 1-2. The present claims therefore provide a gel electrolyte secondary cell including a negative electrode active material having a mean particle size of 5 to 100 μm , wherein the negative electrode active material comprises sintered meso-carbon micro-beads; and wherein the non-aqueous solvent comprises propylene carbonate. In contrast, the cited references are deficient with respect to the present claims.

C. THE REJECTION OF CLAIMS 26-32 AND 35-41 UNDER 35 U.S.C. §103(a) TO MACFADDEN AND MARUYAMA SHOULD BE REVERSED BECAUSE THE EXAMINER HAS FAILED TO ESTABLISH A PRIMA FACIE CASE OF OBVIOUSNESS

Appellants respectfully submit that the obviousness rejection of Claims 26-32 and 35-41 should be reversed because the Examiner has failed to establish a *prima facie* case of obviousness. Specifically, the Examiner has failed to establish a *prima facie* case of obviousness because, even if combinable, *MacFadden* and *Mariyama* fail to disclose or render obvious each and every element of independent Claim 26.

1. Even if combinable, *MacFadden* and *Mariyama* Fail to Disclose Each and Every Element of Independent Claim 26

Independent Claim 26 recites, in part, a gel electrolyte secondary cell comprising: a positive electrode; a negative electrode comprising a current collector and a powder mixture composed of a negative electrode active material having a mean particle size of 5 to 100 μm ; and

a gel electrolyte comprising an electrolyte salt, a non-aqueous solvent and a high-molecular weight material, wherein the non-aqueous solvent comprises propylene carbonate and ethylene carbonate, wherein a content of propylene carbonate ranges from 10 mol% to 75 mol%, and wherein the negative electrode active material comprises sintered meso-carbon micro-beads. In contrast, even if combinable, *MacFadden* and *Maruyama* fail to disclose every element of Claim 26.

For example, even if combinable, *MacFadden* and *Maruyama* fail to disclose or suggest a gel electrolyte secondary cell wherein the graphite material comprises sintered meso-carbon micro-beads as recited, in part, by Claim 26. The Examiner asserts that the phrase “comprises sintered meso-carbon micro-beads” is a product-by-process limitation which has not been given patentable weight. See, Final Office Action dated May 10, 2012 (“Final Office Action”), page 2, lines 6-9. The Examiner explains that “[t]he claims require a graphite material” and “[t]he material used to obtain *the graphite* is not given patentable weight in the absence of unexpected results.” See, Final Office Action, page 2, line 9; page 9, lines 20-22 (emphasis added).

However, contrary to the Examiner’s assertion, Claim 26 does not recite a “graphite” material and instead expressly requires that the negative electrode active material sintered meso-carbon micro-beads. As explained in the Specification and discussed previously, it is well known in the art that the physical properties of graphite materials vary *based on the starting material and the production process*. See, Specification, page 5, lines 16-21; page 6, lines 1-5; *Affidavit*, ¶¶ 4-5 (emphasis added). One of ordinary skill in the art would understand that different production processes and different starting materials result in different graphite materials having *widely varying* physical properties and, thus, a negative electrode active material comprising sintered meso-carbon micro-beads is distinct and nonobvious from graphite materials formed using other starting materials. As a result, Appellants respectfully submit that the limitation “sintered meso-carbon micro-beads” is entitled to patentable weight.

Moreover, the limitation should be given patentable weight because the Specification demonstrates unexpected results between active materials comprising sintered meso-carbon micro-beads and graphite materials formed by other processes and starting materials. For example, Table 1 demonstrates charging/discharging efficiencies for a gel electrode cell containing a lithium metal foil positive electrode, an electrolyte composed of 35 mol % propylene carbonate and 65 mol % ethylene carbonate, and a negative electrode when various

carbonaceous materials were used as the negative electrode active material. See, *Affidavit*, ¶ 6. When the negative electrode material was a fired material of *meso-carbon micro-beads* having a particle size such that the specific surface area is $3.6 \text{ m}^2/\text{g}$ and $1.2 \text{ m}^2/\text{g}$, respectively, initial charging/discharging efficiencies of 82.8% and 82.6% were obtained. See, *Affidavit*, ¶ 6; Specification, Table 1.

In contrast, when the same cell was used except that the negative electrode material was a *fired petroleum coke* having a specific surface area of $4.5 \text{ m}^2/\text{g}$, the initial charging/discharging efficiency was significantly lower—61%. See, *Affidavit*, ¶ 6; Specification, Table 1. One of ordinary skill in the art would thus understand that a gel electrolyte secondary cell including a negative electrode active material comprising sintered meso-carbon micro-beads having the claimed particle size achieves an unexpectedly high charging/discharging efficiency when combined with propylene carbonate and is thus nonobvious over gel electrolyte secondary cells including graphite materials formed from other starting materials. See, *Affidavit*, ¶ 6.

In response to Appellants' previous arguments regarding different starting materials, the Examiner alleges that even if graphite materials made from different starting materials are "distinguishable from" each other, "'distinguishable from' does not equate to 'unobvious from.'" See, Final Office Action, page 10, lines 6-10. However, Appellants do not merely allege that graphite materials made from different starting materials are distinguishable but rather that graphite materials made from different starting materials have *widely varying* physical properties. See, Specification, page 5, lines 16-21; page 6, lines 1-5; *Affidavit*, ¶¶ 4-5 (emphasis added). Furthermore, as discussed above, the Specification demonstrates significantly higher (i.e., unexpected and not obvious) initial charging/discharging efficiencies for a graphite material made from sintered meso-carbon micro-beads versus a graphite material prepared by firing petroleum coke. As such, one of ordinary skill in the art would understand that the claimed negative electrode active material is not obvious from other prior art graphite materials prepared by other processes.

The Examiner further alleges that Appellants do not provide persuasive arguments of unexpected results because "[e]vidence of unexpected results must distinguish the claimed invention over the prior art *of record*," and *MacFadden* is silent regarding the starting material used to produce its graphite. See, Final Office Action, page 10, lines 10-14 (emphasis added).

However, contrary to the Examiner's assertion, evidence of unexpected results need not compare the invention with the prior art of record and instead must compare the claimed subject matter "with the closest prior art." See, M.P.E.P. § 716.02(e) (2010) (emphasis added). The claimed invention may be compared with prior art that is more closely related to the invention than the prior art relied upon by the examiner. See, M.P.E.P. § 716.02(e)(I) (2010).

For example, in *Ex parte Humber*, the Patent Office rejected claims to a 13-chloro substituted compound as obvious over nonchlorinated analogs of the claimed compound. 217 U.S.P.Q. 265 (Bd. App. 1961). "Evidence showing unexpected results for the claimed compound as compared with the 9-, 12-, and 14- chloro derivatives of the compound rebutted the *prima facie* case of obviousness because the compounds compared against were closer to the claimed invention than the prior art relied upon." *Id.* (cited in M.P.E.P. § 716.02(e)(I) (2010)). Similarly, the Specification in this case demonstrates unexpectedly high initial charging/discharging efficiencies for a graphite material comprising sintered meso-carbon micro-beads as compared with a specific graphite material comprising fired petroleum coke. See, Specification, Tables 1-2. In contrast, the prior art relied on by the Examiner merely discloses "graphite" anode active materials, without any teaching regarding the particular starting material or process used to make the "graphite" material. See, *MacFadden*, column 4, lines 9-13; *Mariyama*, column 5, lines 9-10. As such, Appellants' evidence of unexpected results compares closer prior art than the art relied on by the Examiner and is sufficient to show nonobviousness.

Moreover, Appellants respectfully submit that it would be impossible to compare the claimed material to the graphite materials of the cited references precisely because *MacFadden* and *Mariyama* do not disclose specific graphite materials or the specific starting materials used to make its "graphite," and, thus, the exact specifications for those materials do not exist. "Although evidence of unexpected results must compare the claimed invention with the closest prior art, applicant is not required to compare the claimed invention with subject matter *that does not exist* in the prior art." See, M.P.E.P. § 716.02(e)(III) (2010) (citing *In re Chapman*, 357 F.2d 418, 148 U.S.P.Q. 711 (CCPA 1966) and stating that "Requiring applicant to compare claimed invention with polymer suggested by the combination of references relied upon in the rejection of the claimed invention under 35 U.S.C. 103 'would be requiring comparison of the results of the invention with the results of the invention'").

MacFadden merely discloses a carbon anode active material that may be in the form of graphite generally and fails to specify the particular type of graphite material used. See, *MacFadden*, column 4, lines 9-13. *Mariyama* similarly teaches a battery wherein "[t]he carbon used as the active material may be properly selected from natural or artificial graphite" but fails to specify the starting material or production process for the graphite. See, *Mariyama*, column 5, lines 9-10. Thus, even if combinable, *MacFadden* and *Mariyama* both fail to disclose or suggest a negative electrode active material comprising sintered meso-carbon micro-beads in accordance with independent Claim 26.

D. EVEN IF THE EXAMINER HAS ESTABLISHED A PRIMA FACIE CASE OF OBVIOUSNESS WITH RESPECT TO CLAIM 26, APPELLANT HAS REBUTTED THE PRIMA FACIE CASE OF OBVIOUSNESS BY DEMONSTRATING UNEXPECTED RESULTS

For at least substantially the same reasons discussed previously, Appellants respectfully submit that the Specification and *Affidavit* demonstrate unexpected results between active materials comprising sintered meso-carbon micro-beads and graphite materials formed by other processes and starting materials. Specifically, the Specification and *Affidavit* demonstrate that a gel electrolyte secondary cell including a negative electrode active material comprising sintered meso-carbon micro-beads having the claimed particle size achieves an unexpectedly high charging/discharging efficiency when combined with propylene carbonate and is thus nonobvious over gel electrolyte secondary cells including graphite materials formed from other starting materials. Accordingly, the showing of unexpected results provides evidence that the negative electrode active material of Claim 26 is not *prima facie* obvious in view of the cited references.

For at least the reasons set forth above, independent Claim 26 is novel and non-obvious over the cited references. Accordingly, Appellants respectfully request that the rejection of Claims 26-32 and 35-41 under 35 U.S.C. §103(a) to *MacFadden* and *Mariyama* be reconsidered and withdrawn.

E. THE REJECTION OF CLAIMS 26-32 AND 35-41 UNDER 35 U.S.C. §103(a) TO MACFADDEN AND OZAKI SHOULD BE REVERSED BECAUSE THE EXAMINER HAS FAILED TO ESTABLISH A PRIMA FACIE CASE OF OBVIOUSNESS

Appellants respectfully submit that the obviousness rejection of Claims 26-32 and 35-41 should be reversed because the Examiner has failed to establish a *prima facie* case of obviousness. Specifically, the Examiner has failed to establish a *prima facie* case of obviousness because, even if combinable, *MacFadden* and *Ozaki* fail to disclose or render obvious each and every element of independent Claim 26. Moreover, one of ordinary skill in the art would have no reason to combine the teachings of *MacFadden* and *Ozaki* to arrive at independent Claim 26.

1. Even if combinable, *MacFadden* and *Maruyama* Fail to Disclose Each and Every Element of Independent Claim 26

Appellants surprisingly discovered that when the graphite negative electrode material comprises sintered meso-carbon micro-beads, a high charging/discharging efficiency can be obtained in a gel electrolyte containing propylene carbonate even when the graphite material has a small particle size and, thus, a high discharge capacity. See, Specification, page 7, lines 13-21; page 8, lines 1-4.

However, even if combinable, *MacFadden* and *Ozaki* fail to disclose or suggest using sintered meso-carbon micro-beads having the claimed size in combination with a solvent containing propylene carbonate as required, in part, by Claim 26. As supported by the *Affidavit*, *MacFadden* merely discloses using graphite in a solid polymer electrolyte cell containing propylene carbonate and fails to teach that the graphite comprises sintered meso-carbon micro-beads. See, *MacFadden*, column 4, lines 9-13; column 5, lines 11-20; *Affidavit*, ¶ 8. *Ozaki* merely discloses a micro-bead based electrode with an electrolyte containing ethylene carbonate, diethyl carbonate and methyl propionate and fails to teach the claimed combination of sintered meso-carbon micro-beads having the claimed size and a solvent containing propylene carbonate. See, *Ozaki*, column 2, lines 66-67; column 3, lines 1-7; column 4, lines 54-58; *Affidavit*, ¶ 10. Instead, pursuant to conventional wisdom, *Ozaki* teaches that propylene carbonate generates unfavorable side reactions with its small-sized graphite particles and therefore should not be used with its graphite particles. See, *Ozaki*, column 7, lines 5-16; *Affidavit*, ¶ 10.

2. It Would Not Have Been Obvious to Combine the Teachings of MacFadden and Ozaki to Arrive At Independent Claim 26

Appellants respectfully submit that one of ordinary skill in the art would have no reason to combine the cited references to arrive at the present claims because *Ozaki* teaches away from using its mesophase carbon particles with a propylene carbonate solvent as required by the present claims. References must be considered as a whole and those portions teaching against or away from each other and/or the claimed invention must be considered. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve Inc.*, 796 F.2d 443 (Fed. Cir. 1986). "A prior art reference may be considered to teach away when a person of ordinary skill, upon reading the reference would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the Applicant." *Monarch Knitting Mach. Corp. v. Fukuvara Indus. Trading Co., Ltd.*, 139 F.3d 1009 (Fed. Cir. 1998) (quotation omitted) (emphasis added).

The Examiner asserts that Appellants' argument that *Ozaki* teaches away from propylene carbonate has been addressed by the Board of Patent Appeals and has been determined to be non-persuasive. See, Final Office Action, page 11, lines 6-8. However, Appellants respectfully submit that this mischaracterizes the Board's decision. In the Examiner's Answer, the Examiner argued that Appellants' arguments regarding the use of propylene carbonate were not persuasive because "Ozaki is not applied to teach the electrolyte of the instant claims. . . . One of skill would be motivated to use the negative electrode of Ozaki for the negative electrode of Akashi because Akashi clearly suggests a negative electrode comprising a graphitized carbonaceous material." See, Examiner's Answer dated March 9, 2004 ("Examiner's Answer"), page 5, lines 19-22, page 6, lines 1-2.

The Board merely agreed with the Examiner that *Akashi* was being relied on for the teaching of propylene carbonate and, thus, *Ozaki* was not necessary to show the required element of a solvent containing propylene carbonate:

Appellants also maintain that Akashi and Ozaki are not combinable because Ozaki 'clearly disfavors the use of propylene carbonate as an organic solvent of the organic electrolyte for the non-aqueous electrolyte' (page 8 of principal brief, third paragraph). However, *Akashi, not Ozaki, discloses the use of propylene carbonate as an organic solvent.* . . .

See, Board Decision dated January 19, 2006 ("Board Decision"), page 5, lines 4-9. The Board further stated that "appellants have not demonstrated why one of ordinary skill in the art would have been dissuaded *from using the carbonaceous material of Ozaki for the negative electrode of Akashi.*" See, Board Decision, page 5, lines 9-12 (emphasis added). However, the issue now is not whether one skilled in the art would have had a reason to substitute the carbonaceous material of *Ozaki* for the negative electrode material of *Akashi* but rather whether *Ozaki teaches away* from using propylene carbonate *with its mesophase graphite particles.*

The Board never addressed whether *Ozaki teaches away* from the use of propylene carbonate. In fact, none of the Examiner's Answer, the Appeal Brief dated January 1, 2004 or the Board Decision even uses the phrase "teaching away." Appellants also submit that the Board's previous decision should not be controlling here because the claims have been amended several times, specifically regarding the amount of propylene carbonate and the particle size of the graphite, since the Board Decision issued. Regardless of whether it would have been obvious to replace the graphite material of *MueFadden* with the mesophase graphite particles of *Ozaki*, it is improper for the Examiner to ignore portions of *Ozaki* that teach away from using its graphite material with propylene carbonate. See, M.P.E.P. § 2141.02 (VD) (2010) ("A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention").

Ozaki expressly teaches that "**propylene carbonate (PC) is not employed**" as a solvent with its carbon particles "because [PC] decomposes to generate a gas [at] during charging." See, *Ozaki*, column 7, lines 5-8 (emphasis added). As discussed previously, one of ordinary skill in the art would understand that propylene carbonate decomposes in a graphite-based cell due to the instability of propylene carbonate *against a graphite material.* See, Specification, page 5, lines 6-15. Furthermore, as set forth in the Specification and *Affidavit*, it is well known that the degree of decomposition of propylene carbonate in a graphite cell varies depending on the physical properties of the graphite material. See, *Affidavit*, ¶ 5; Specification, page 5, lines 16-21; page 6, lines 1-5. As such, *Ozaki's* teaching not to use propylene carbonate because it decomposes would have suggested to one of ordinary skill in the art that propylene carbonate would decompose *due to the reaction with the mesophase graphite particles* of *Ozaki.* Therefore, Appellants respectfully submit that *Ozaki* teaches away from using its mesophase graphite particles with a solvent containing propylene carbonate.

The Examiner further attempts to rebut Appellants' arguments by noting that "the claims on appeal require as little as 10 mol% of propylene carbonate." See, Final Office Action, page 11, lines 13-14. However, one of ordinary skill in the art would understand that *Ozaki* teaches away from using *any* propylene carbonate with its graphite particles. For example, *Ozaki* teaches that ethylene carbonate may not be used alone in its electrolyte but can be mixed with other solvents:

On the other hand, ethylene carbonate (EC) used *alone* is not suitable, since it has a high melting temperature and is solid at ordinary temperature, *though it has no unfavorable side reaction, as of PC*. However, *EC may be used in a mixed solvent* of EC and either ether such as 1,2 dimethoxyethane, chain carbonate such as diethyl carbonate, ethyl methyl carbonate, or aliphatic-carboxylic acid ester such as methyl propionate. . . .

See, *Ozaki*, column 7, lines 8-16 (emphasis added). This portion of *Ozaki* expressly distinguishes ethylene carbonate from propylene carbonate and states that ethylene carbonate may be used in a mixed solvent because "it has no unfavorable side reaction," unlike propylene carbonate. See, *Ozaki*, column 7, lines 8-11. Furthermore, *Ozaki* expressly states that propylene carbonate is "not employed" as a solvent in its electrolyte. See, *Ozaki*, column 7, lines 5-8. Therefore, one of ordinary skill in the art would understand that *Ozaki* teaches away from using *any* propylene carbonate with its mesophase graphite particles. Moreover, Appellants respectfully note that Claim 41 requires 35 mol% propylene carbonate and 65 mol% ethylene carbonate, rather than the 10 mol% limitation addressed by the Board.

The Examiner further asserts that "the section of *Ozaki* cited by Applicant[s] as assertedly teaching away from the claimed invention (col. 2, lines 3-6) is part of the background section of *Ozaki*." See, Final Office Action, page 11, lines 18-20. However, Appellants respectfully note that the portion of *Ozaki* that teaches away from using propylene carbonate with its mesophase graphite particles is column 7, lines 5-16, which is not part of the background section. See, *Ozaki*, column 7, lines 5-16. Moreover, Appellants note, even if the alleged teaching away in *Ozaki* occurred in the background section, any portions of a reference that teaches away from other cited references or the claims must be considered (i.e., the references must be considered as a whole). *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve Inc.*, 796 F.2d 443 (Fed. Cir. 1986). Appellants respectfully submit that the Examiner has applied hindsight reasoning and failed to consider *Ozaki* as a whole, including those portions of *Ozaki* teaching away from the present claims.

Claim 26 requires the claimed graphite material to be used in combination with a solvent containing propylene carbonate. In stark contrast, as discussed previously, *Ozaki* teaches that propylene carbonate is not used as a solvent with its mesophase carbon micro beads. See, *Ozaki*, column 7, lines 5-11. One of ordinary skill in the art would thus have been discouraged from using the mesophase carbon micro beads of *Ozaki* with a propylene carbonate solvent to arrive at the present claims.

Furthermore, the combination of propylene carbonate and sintered meso-carbon micro-beads having the claimed particle size would not have been obvious because Appellants *proceeded contrary to the conventional understanding* at the time of the invention. "The totality of the prior art must be considered, and proceeding contrary to accepted wisdom in the art is evidence of nonobviousness. *In re Hedges*, 783 F.2d 1038 (Fed. Cir. 1986) (Applicant's claimed process for sulfonating diphenyl sulfone at a temperature above 127° C was contrary to accepted wisdom because the prior art as a whole suggested using lower temperatures for optimum results as evidenced by charring, decomposition, or reduced yields at higher temperatures)." See, M.P.E.P. § 2145(X)(D)(3) (2010). "Furthermore, '[k]nown disadvantages in old devices which would *naturally discourage search for new inventions* may be taken into account in determining obviousness.'" *Id.* (citation omitted).

As discussed previously, it was well-known in the art that the decomposition of propylene carbonate is significant if the graphite material has a small particle size, thereby resulting in a lower charging/discharging efficiency of the battery. See, *Affidavit*, ¶ 5. Thus, the conventional understanding at the time of the invention was that it was undesirable to use graphite having a small particle size in a battery containing propylene carbonate in the electrolytic solution. *Id.* This is supported by *Ozaki's* teaching that it was unfavorable to use propylene carbonate with its mesophase graphite particles. See, *Ozaki*, column 7, lines 5-16. However, Appellants surprisingly discovered that when sintered meso-carbon micro-beads are used, a high charging/discharging efficiency can be obtained in a gel electrolyte containing propylene carbonate even when the graphite material has a small particle size. See, Specification, page 7, lines 13-21; page 8, lines 1-4. This discovery is contrary to conventional wisdom and, thus, it would not have been obvious to combine the mesophase particles of *Ozaki* with the propylene carbonate of *MacFadden* to arrive at the present claims.

F. EVEN IF THE EXAMINER HAS ESTABLISHED A *PRIMA FACIE* CASE OF OBVIOUSNESS WITH RESPECT TO CLAIM 26, APPELLANT HAS REBUTTED THE *PRIMA FACIE* CASE OF OBVIOUSNESS BY DEMONSTRATING UNEXPECTED RESULTS

Appellants respectfully submit that it would not have been obvious to combine the propylene carbonate of *MacFadden* with the mesophase graphite particles of *Ozaki* to arrive at the present claims because the claimed combination achieves unexpected results. See, *Affidavit*, ¶¶ 6-7. As demonstrated in Table 1 of the Specification, a coin-shaped gel electrode cell containing a lithium metal foil positive electrode, an electrolyte composed of 35 mol % propylene carbonate and 65 mol % ethylene carbonate, and a negative electrode comprising various graphite materials was evaluated. See, *Affidavit*, ¶ 6. When the graphite negative electrode material was a fired material of meso-carbon micro-beads having a particle size such that the specific surface area is 3.6 m²/g and 1.2 m²/g, respectively, initial charging/discharging efficiencies of 82.8% and 82.6% were obtained. See, *Affidavit*, ¶ 6. In contrast, when the same cell was used and the graphite negative electrode material was a fired petroleum coke having a specific surface area of 4.5 m²/g, the initial charging/discharging efficiency was significantly lower -- 61%.

Similarly, Table 2 demonstrates initial charging/discharging efficiencies of 74.5% and 74.1% in a gel electrolyte cell containing propylene carbonate when a graphite material comprised of sintered meso-carbon micro-beads is used as the anode material, whereas a ***significantly lower efficiency of only 56%*** is achieved in the same gel electrolyte cell when the anode material is substituted with a graphite material obtained by firing petroleum coke. See, *Affidavit*, ¶ 7. As such, one of ordinary skill in the art would understand that a graphite material comprising sintered meso-carbon micro-beads having the claimed particle size achieves an unexpectedly high charging/discharging efficiency when combined with propylene carbonate.

For at least the reasons set forth above, independent Claim 26 is novel and non-obvious over the cited references. Accordingly, Appellants respectfully request that the rejection of Claims 26-32 and 35-41 under 35 U.S.C. §103(a) to *MacFadden* and *Ozaki* be reconsidered and withdrawn.

G. THE REJECTION OF CLAIMS 26-32 AND 35-41 UNDER 35 U.S.C. §103(a) TO AKASHI AND OZAKI SHOULD BE REVERSED BECAUSE THE EXAMINER HAS FAILED TO ESTABLISH A PRIMA FACIE CASE OF OBVIOUSNESS

Appellants respectfully submit that the obviousness rejection of Claims 26-32 and 35-41 should be reversed because the Examiner has failed to establish a *prima facie* case of obviousness. Specifically, the Examiner has failed to establish a *prima facie* case of obviousness because, even if combinable, *Akashi* and *Ozaki* fail to disclose or render obvious each and every element of independent Claim 26. Moreover, one of ordinary skill in the art would have no reason to combine the teachings of *Akashi* and *Ozaki* to arrive at independent Claim 26.

1. Even if combinable, MacFadden and Maruyama Fail to Disclose Each and Every Element of Independent Claim 26

Appellants surprisingly discovered that when the graphite negative electrode material comprises sintered meso-carbon micro-beads, a high charging/discharging efficiency can be obtained in a gel electrolyte containing propylene carbonate even when the graphite material has a small particle size and, thus, a high discharge capacity. See, Specification, page 7, lines 13-21; page 8, lines 1-4.

However, even if combinable, *Akashi* and *Ozaki* fail to disclose a gel electrolyte secondary cell including sintered meso-carbon micro-beads having the claimed size in combination with a solvent containing propylene carbonate as required, in part, by Claim 26. As discussed previously, *Ozaki* fails to teach the claimed combination of sintered meso-carbon micro-beads having the claimed size and a solvent containing propylene carbonate. See, *Affidavit*, ¶ 10. *Akashi* is too general in scope to lead one skilled in the art to the gel electrolyte secondary cell as specifically claimed, when considered in combination with *Ozaki*. For example, *Akashi* teaches generally using “graphite” as a negative electrode material but in its examples discloses using propylene carbonate with a lithium metal anode. See, *Akashi*, page 5, lines 3-16; page 10, lines 29-40; page 11, lines 1-6; *Affidavit*, ¶ 11. Thus, even if combinable, *Akashi* and *Ozaki* fail to disclose using sintered meso-carbon micro-beads having the claimed size in combination with propylene carbonate in accordance with independent Claim 26.

2. It Would Not Have Been Obvious to Combine the Teachings of *Akashi* and *Ozaki* to Arrive At Independent Claim 26

For at least the reasons discussed previously and as supported by the *Affidavit*, it would not have been obvious to combine the mesophase graphite particles of *Ozaki* with a solvent containing propylene carbonate to arrive at the present claims because: (1) *Ozaki* teaches away from using its mesophase carbon particles with a propylene carbonate solvent; and (2) combining sintered meso-carbon micro-beads having a small particle size with an electrolyte containing propylene carbonate was contrary to conventional wisdom at the time of the invention. See, *Ozaki*, column 7, lines 5-16; Specification, Tables 1-2; *Affidavit*, ¶¶ 5-7.

H. EVEN IF THE EXAMINER HAS ESTABLISHED A *PRIMA FACIE* CASE OF OBVIOUSNESS WITH RESPECT TO CLAIM 26, APPELLANT HAS REBUTTED THE *PRIMA FACIE* CASE OF OBVIOUSNESS BY DEMONSTRATING UNEXPECTED RESULTS

Appellants respectfully submit that it would not have been obvious to combine the propylene carbonate of *Akashi* with the mesophase graphite particles of *Ozaki* to arrive at the present claims because the claimed combination achieves unexpected results. See, *Affidavit*, ¶¶ 6-7. As discussed previously, the Specification and *Affidavit* demonstrate that a graphite material comprising sintered meso-carbon micro-beads having the claimed particle size achieves an unexpectedly high charging/discharging efficiency when combined with propylene carbonate.

For at least the reasons set forth above, independent Claim 26 is novel and non-obvious over the cited references. Accordingly, Appellants respectfully request that the rejection of Claims 26-32 and 35-41 under 35 U.S.C. §103(a) to *Akashi* and *Ozaki* be reconsidered and withdrawn.

IV. CONCLUSION

Appellants respectfully submit that the Examiner has failed to establish obviousness under 35 U.S.C. §103 with respect to independent Claim 26 and, thus, Claims 27-32 and 35-41 that depend therefrom. Accordingly, Appellants respectfully submit that the rejections are erroneous in law and in fact and should, therefore, be reversed by this Board.

The Director is authorized to charge \$620 for the Appeal Brief and any additional fees which may be required, or to credit any overpayment to Deposit Account No. 02-1818. If such a withdrawal is made, please indicate the Attorney Docket No. 3712174-00037 on the account statement.

Respectfully submitted,

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Dated: August 13, 2012

CLAIMS APPENDIX

PENDING CLAIMS ON APPEAL OF
U.S. PATENT APPLICATION SERIAL NO. 09/162,992

26. A gel electrolyte secondary cell comprising:
a positive electrode;
a negative electrode comprising a current collector and a powder mixture composed of a negative electrode active material having a mean particle size of 5 to 100 μm ; and
a gel electrolyte comprising an electrolyte salt, a non-aqueous solvent and a high-molecular weight material,
wherein the non-aqueous solvent comprises propylene carbonate and ethylene carbonate,
wherein a content of propylene carbonate ranges from 10 mol% to 75 mol%,
and wherein the negative electrode active material comprises sintered meso-carbon micro-heads.
27. The gel electrolyte secondary cell according to claim 26 wherein the high-molecular weight material contains a nitrile group in a side chain thereof.
28. The gel electrolyte secondary cell according to claim 27 wherein the high-molecular weight material is polyacrylonitrile.
29. The gel electrolyte secondary cell according to claim 28 wherein a molar ratio of an acrylonitrile monomer to the non-aqueous solvent is 5:95 to 30:70.

30. The gel electrolyte secondary cell according to claim 26, wherein the electrolyte salt of the non-aqueous solvent is LiPF_6 and wherein a concentration of LiPF_6 with respect to non-aqueous solvent is 0.4 mol/cm^3 to 2 mol/cm^3 .

31. The gel electrolyte secondary cell according to claim 26 wherein the positive electrode contains a lithium-containing compound.

32. The gel electrolyte secondary cell according to claim 31 wherein the lithium-containing compound is a complex compound of lithium and a transition metal.

35. The gel electrolyte secondary cell according to claim 26 wherein the non-aqueous solvent includes at least one compound selected from the group consisting of γ -butyrolactone, methyl ethyl carbonate and dimethyl carbonate in addition to propylene carbonate and ethylene carbonate.

36. The gel electrolyte secondary cell according to claim 26 wherein the high molecular weight material has a number average molecular weight ranging from 5000 to 500000.

37. The gel electrolyte secondary cell according to claim 26 wherein the content of propylene carbonate is between 35 mol% and 75 mol %.

38. The gel electrolyte secondary cell according to claim 26 wherein the powder mixture of the negative electrode comprises a polyvinylidene fluoride binder.

39. The gel electrolyte secondary cell according to claim 26 wherein the meso-carbon micro-beads are sintered at a temperature between 2500° C and 3500° C.

40. The gel electrolyte secondary cell according to claim 26 wherein a specific surface area of the negative electrode active material as measured by the BET method ranges from 0.1 to 10 m²/g.

41. The gel electrolyte secondary cell according to claim 26 wherein the non-aqueous solvent comprises 35 mol% propylene carbonate and 65 mol% ethylene carbonate.